

**Amendments to the Specification:**

Please replace the paragraph [0007] beginning at page 3, line 4, with the following rewritten paragraph:

[0007] The invention also relates to a medical X-ray device arrangement for producing three-dimensional information of an object (4) in a medical X-ray imaging, The medical X-ray device arrangement comprises:

- an X-ray source for X-radiating the object from at least two different directions
- a detector for detecting the X-radiation to form projection data of the object
- means for modelling the object mathematically [s1]utilizing the projection data to

solve the imaging geometry and/or the motion of the object, where the solving concerns either some or all parts of the imaging geometry and/or the motion of the object.

and the medical X-ray device arrangement ~~comprises~~includes:

- means for utilizing said projection data and said mathematical modelling of the object in Bayesian inversion based on Bayes' formula

$$p(x, \theta | m) = \frac{p_{pr}(\theta) p_{pr}(x) p(m | x, \theta)}{p(m)}$$

to produce three-dimensional information of the object, the prior distribution  $p_{pr}(\theta)$  representing the prior knowledge of the ~~the~~ imaging geometry and/or the motion of the object (4), the prior distribution  $p_{pr}(x)$  representing mathematical modelling of the object,  $x$  representing the object image vector, which comprises values of the X-ray attenuation coefficient inside the object,  $\theta$  representing the parameter vector of the imaging geometry and/or the motion of the object (4),  $m$  representing projection data, the likelihood distribution  $p(m|x, \theta)$  representing the X-radiation attenuation model between the object image vector  $x$ . geometry parameter vector  $\theta$  and projection data  $m$ ,  $p(m)$  being a normalization constant and the posteriori distribution  $p(x, \theta | m)$  representing the three-dimensional information of the object (4) and the imaging geometry



including the motion of the object.

Please replace the paragraph [0025] beginning at page 7, line 8, with the following rewritten paragraph:

**[0025]** In figure 1 is shown a simple example of X-ray imaging, where an X-ray source 2 is placed on one side of an object 4 under imaging. Radiation passes through the object and is detected by a detector 6 on the other side. The X-ray source is for example a X-ray source of an intraoral X-ray source of a dentist, of a dental panoramic X-ray device, of a surgical C-arm X-ray device, of a mammography device or of any other medical X-ray device and the detector 6 is a detector of some of those devices. Usually the detector 6 is a digital sensor that can be thought of as a 2-D array of almost pointlike detectors.

Please replace the paragraph [0032] beginning at page 8, line 28, with the following rewritten paragraph:

**[0032]** In figures 4A and 4B there are presented examples of parts of boundary and cracks that are visible or undetectable ~~indetectable~~ in reconstruction without a priori information. Figure 4A there is an object 4 under imaging with edge on the surface of the object. The edge is detectable on the leftmost position where the edge is more parallel to the direction of the X-rays. In the figure 4B there is a crack inside of the object 4. The crack is detectable in the leftmost position parallel to the angle of measurement.

Please replace the paragraph [0045] beginning at page 12, line 17, with the following rewritten paragraph:

**[0045]** In figure 7 is presented an intraoral X-ray device 5 arrangement presenting the first preferred embodiment of the invention. It is important to note ~~notice~~ that this is only an example of the medical X-ray device 5 arrangement where the invention is possible to be utilized.



Please replace the paragraph [0047] beginning at page 12, line 24, with the following rewritten paragraph:

[0047] In the first preferred embodiment of the invention the articulated arm arrangement 3 moves the X-ray source 2 to the right position. The X-radiation begins by pressing the exposure button 12. The X-ray source 2 X-radiates the object 4, which is for example teeth of a patient. The detector 6 detects the X-radiation. The image information which is got by detecting the X-radiation is sent by communication link 16 to the computer 14. The computer comprises the software means 15 to process the image information according to the invention. There can be more than one computer 14 and also the software means 15 can situate in more than one computer 14. For example a the-first computer 14 is a computer which is used in x-ray imaging. A The-second computer 14 is a computer which is used in processing the image information according to the invention. It is possible to have the second computer 14 far away from the actual medical x-ray device 5. For simplicity in figure 7 is shown only one computer 14.

Please replace the paragraph [0053] beginning at page 14, line 6, with the following rewritten paragraph:

[0053] In the measurement geometry the focal point of the X-ray source 2 moves horizontally on a circle in the plane of the paper<sup>10</sup>, with center at the detector 6, see Figure 8. In Figure 8, the detector 6 corresponds to one row of CCD pixels in the CCD sensor.

Please replace the paragraph [0065] beginning at page 17, line 11, with the following rewritten paragraph:

The measurements are taken into account in the form of the likelihood distribution



$$P(m^{(j)}|w^{(j)})=c \exp \left\{ -\frac{1}{2} (m^{(j)} - Ax^{(j)})^T \Sigma^{-1} (m^{(j)} - Ax^{(j)}) \right\} \quad (15)$$

where  $\Sigma$  is the covariance matrix of the Gaussian noise vector  $e$ .  $c$  is ~~is~~ a normalization constant.

Please replace the paragraph [0074] beginning at page 18, line 25, with the following rewritten paragraph:

[0074] In the first, second, third and fourth preferred embodiments of the invention the basic method steps are the same as mentioned with the flow chart in figure 6. The utilizing of the invention in the second, third and fourth preferred embodiment is similar to what is described with the first preferred embodiment of the invention and elsewhere in this application except for different medical x-ray imaging applications and their differences because of different medical x-ray devices and different objects to be x-ray imaged.

Please replace the paragraph [0075] beginning at page 19, line 3, with the following rewritten paragraph:

[0075] What makes this invention especially inventive is that the imaging geometry and/or the motion of the object is solved with the image reconstruction simultaneously or having different timings. This is based on that projection data itself contains sufficient ~~sufficiently~~ information about the imaging geometry and also sufficient ~~sufficiently~~ information about the 3D reconstruction. Neither reference feature points nor prior knowledge of the motion are needed.